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ABSTRACT

A model for course planning that provides a way of looking at college instruction and an approach to preparing effective courses is presented. It is suggested that: teaching is an experimental activity, there is no correct way to teach, a teacher sets up the conditions for learning, and both the course and teacher need to assume part of the responsibility if students fail to learn. The model views instruction as a learning system characterized by a goal; interdependent elements; and an intentional or planned management of people, materials, and procedures. Steps in course planning include: defining the curriculum; stating learning outcomes; identifying and sequencing content; assessing students' characteristics; planning instructional strategies and tests; teaching; evaluating the course and the instructor; and revising the course. In addition to planning tools, the instructional model suggests a strategy for designing instruction for courses, course units, and the overall curriculum. Advantages of the model are that it provides a systematic approach to instruction and a framework for the application of theory and research. Critics argue that: teaching is not really a planned and purposeful activity; the model can create a false expectation about the power of current theory and research; and it overestimates the teacher's responsibility, time and ability, and underemphasizes the student's responsibility. Forms and extensive exercises to assist the teacher in completing each step of the model are provided. (SW)

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INSTRUCTIONAL DEVELOPMENT
WAYS AND MEANS

Course Planning

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EXERCISE I

Why Do We Plan the Way We Do?

I would like you to consider the following questions:

1. How do you typically go about planning a course?

2. Why do you do it that way?

3. How satisfied are you with your approach(es)?

Thinking about and assessing your present approach will be a good place to start this process. *The way you now go about course planning will either be altered or reinforced by the approach described in these materials. Having old ways clearly in mind should allow you to better decide the value and usefulness of the ideas presented to you.*

Do not spend a lot of time on this exercise. But, do jot down your answers.

A MODEL FOR COURSE PLANNING

These materials will introduce you to a model for course planning. This model provides both a way of looking at college instruction and an approach to preparing effective courses for students. This introduction lays out this view of teaching and presents the planning procedures associated with the model. Following it you will find strategies and examples for each step of the model. "Exercises" also are included, to encourage you to try out this approach, possibly with one course you will be teaching next term.

The model of instruction can graphically be displayed as follows:

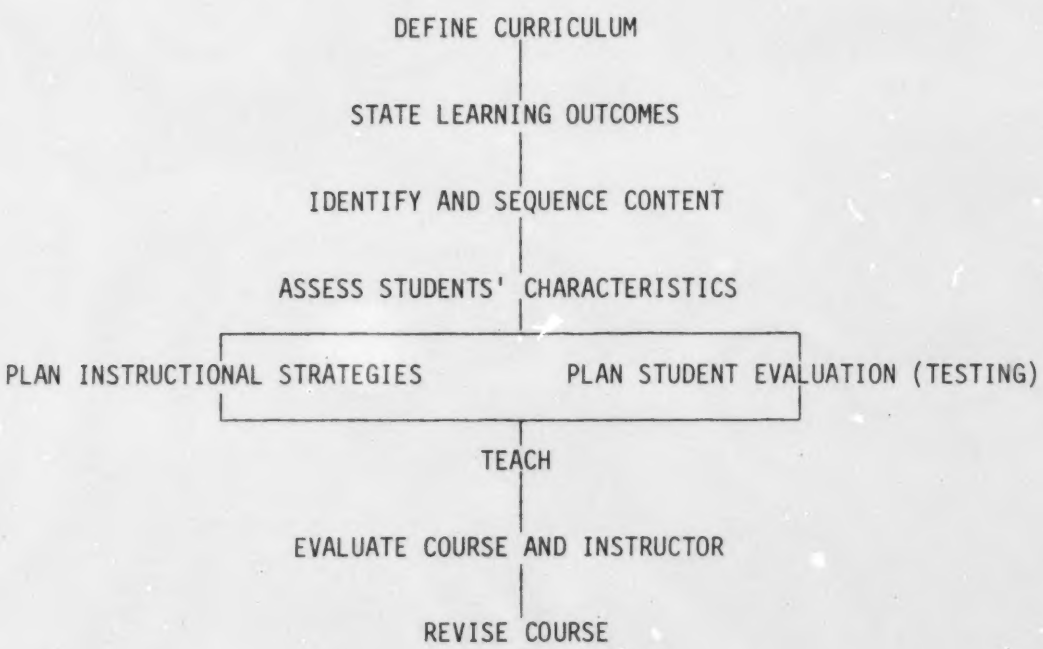


Figure 1: Nine Step Model of Instruction

Model as a View of Instruction

This model of instruction, as a guide to course planning, offers a particular view of instruction--a philosophy of teaching, if you will--as well as a set of tools and a strategy to assist instructional design. Before we get to the tools and strategy and begin plying them on your course, it seems important to spend some time considering the basic rationale behind this approach.

Teaching as Experimentation

Fundamental to this approach is the idea that teaching is an experimental activity. Good teaching, like good research, does require more than experimentation; it involves rationale analysis and synthesis and an element of creativity. But, for teaching to improve it must be put to the test and observed for its successes and failures. Ideally, good design and careful planning should result in a wholly successful unit of instruction. Practically speaking, though, behavioral and social sciences cannot predict with absolute certainty the best arrangement for learning. And, our planning procedures themselves may not be foolproof. For these reasons our plans must be tried out in the spirit of the experimentalist.

Experimentation in teaching is guided by this credo: 1) put as much knowledge of content and insight into learning and teaching as possible into the planning of course, but 2) realize that mistakes will be made, so 3) find those mistakes and correct them.

Teaching as the Setting of Conditions for Learning

In the view of our model, teaching involves more than presenting information to students and testing their recall of the information.

Teaching means giving attention to things about that presentation, and about the students and the social and physical environment, which might enhance or interfere with learning. Research into learning and teaching suggests certain conditions of subject matter organization, student readiness, teacher-student interaction, and physical arrangements necessary for effective and efficient learning, the job of the teacher is to set those conditions for his course.

As an example, we know (through research and our experience as teachers) that a particular attitude toward learning and certain prerequisite knowledge and skill essential if a student is going to benefit from our course. The possession of these characteristics is an important condition for learning.

Course as Learning System

The model asks us to look at instruction in systemic terms. In this view of instruction a course can be thought of almost anthromorphically as an organic system with a life of its own. And, since this system has learning as its purpose, it can be called a learning system. Instruction involves the creation and maintenance of such a system.

A learning system is characterized by 1) a goal, 2) interdependent elements, and 3) an intentional or planned management of people, materials, and procedures. As an example, this workshop can be thought of as a learning system with the twin goals of planning a course and learning a procedure for course planning (remember the workshop objectives?). A number of elements will interact as we pursue these goals: me, you and other participants, the subject matter, these materials, the activities of the workshop, the physical environment, etc. And, I can guarantee you that I have been very intentional and planful as I put together these materials.

The teacher has a very special role in a course qua learning system. He is simultaneously the designer and/or one of the elements of the system. As the designer of this workshop I set the objectives and planned the materials and activities. But, I also will be one of the participants (as presenter and critic of your work) in these activities. This happens in most of the courses we teach. But, we need only think about a completely self-instructional course (PSI, for example), in which the teacher only designs, for this distinction to have some importance.

The image of "course as learning system" may be helpful to you or it may not. The important idea, though, is that instruction is an intentional, planned, interdependent, and goal-oriented activity.

As a way to summarize the rationale behind the model of instruction I have presented, let me list five propositions it suggests about instruction, the instructor, and instructional planning.

1. There is no one correct way to teach. Our incomplete knowledge about learning and instruction do not allow this kind of certainty. Also, there may be alternative means to any instructional goal.
2. A "teacher" is someone who sets up the conditions so that students can learn.
3. If students fail to learn, the course and the teacher need to assume a large part of the responsibility. A teacher does not have control over all the conditions for learning, but where he does and does not set them properly, he should take the responsibility for students' failure.

4. Teaching is a planned and purposeful activity.
5. The abilities of a teacher are learned. A teacher may never become an inspirational lecturer, but he can become an able, and even creative, designer (planner), implementor, and evaluator of instruction.

MODEL AS A SET OF TOOLS AND A STRATEGY FOR COURSE PLANNING

Recall that planning was described earlier as a matter of answering certain questions at each step of the instructional process; e.g.; What is to be taught, etc. In this section a set of procedures or "tools" will be presented which will help answer these questions. Each step in the model of instruction has corresponding "tools" which facilitate course planning.

It will be these procedures with which we will work in this workshop. Learning about these tools, learning how to use them, and applying them to a course will be the primary activities of the workshop. These tools, if acceptable, will become part of your repertoire to be used where useful in planning other courses.

Steps in Instructional Process	Planning Tools
Define Curriculum	Curriculum Development (to define major topics, relationship to other courses)
State Learning Outcomes	Instructional Objectives (to state expectations for student learning)
Identify and Sequence Content	Task Description and Analysis (to identify what needs to be taught in order for students to meet the objectives)
Assess Student Characteristics	Entry Assessment (to assess knowledge, attitudes and skills students bring to a course

Steps in Instructional Process	Planning Tools
Plan Instructional Methods	Strategies and Techniques of Teaching (to choose and plan appropriate methods)
Plan Student Evaluation	Testing and Grading Procedures (to choose and plan appropriate testing and grading procedures)
Teach	Principles of Learning, Motivation, and Individual and Group Behavior (to plan and manage teacher and student activities in the classroom)
Evaluate Course and Instructor	Evaluate Procedures (to evaluate appropriately course design and materials and teacher performance)
Revision	Principles of Revision (to revise appropriately and realistically)

You may already be master of one or more of these tools. If so,that's great! You can be of help and suggestions to other colleagues. What I hope to do is add to your "bag of tricks," suggesting new approaches, and increasing your sophistication.

A Strategy for Course Planning

In addition to a set of tools, the model of instruction suggests a strategy for designing instruction whether it be a course, a unit in a course, or an entire curriculum. The tools can be used together in ways that facilitate your work as a teacher and result in more effective instruction.

Most simply the model can be followed in a linear fashion. Planning can begin with the defining of topics and proceed step-by-step through revision.

The model at its most effective application, though, does not prescribe a slavish adherence to the step-by-step approach. In fact, the model should be thought of as one in which you can enter at any step. A concern with testing is often a beginning point in the redesign of a course. A look at old test items or questions can be the most convenient way to begin identifying course and unit objectives, since an exam supposedly asks students to display the most important learnings of the course. When designing a new course, an assessment of student characteristics is sometimes a first step, before any attempt is made to define topics, objectives, or content.

Also, the planning process suggested by the model is an iterative one. As planning proceeds, you will find yourself moving back-and-forth between steps, as your work at one step points out changes needed at another. After assessing students' knowledge, attitude and skills at the beginning of the course, you may need to adjust the objectives, eliminating some already mastered by most students and adding others to reflect less or greater student preparation than you expected.

Finally as a strategy, not all steps or tools will be appropriate to the particular planning you have in mind. You may already have an adequate statement of objectives. To rewrite them because the model says so would be a foolish waste of energy. The time you currently have to spend on course planning may best be spent on choosing and designing methods and materials appropriate to your objectives.

This approach to course planning, I have tried to show, can be used as rigidly or as flexibly as you wish. Remember: it is a set of tools which if used strategically can result in more satisfying and effective instruction for students.

Advantages and Disadvantages

As with any conceptualization of instruction and approach to planning, this approach has distinct advantages and disadvantages. In my viewpoint the advantages far outweigh the disadvantages. Each of the disadvantages can be overcome. But as a final section to this introductory section, let me put the pros and cons before you and let you decide for yourself.

On the advantage side, this model seems valuable in its own right as a systematic approach to instruction. Conscious consideration of all the elements of a teaching/learning situation and the interrelationships among them should mean that fewer hindrances to effective teaching and learning are overlooked. And, a step-by-step approach to planning can provide an important organizing aid to many of us who often do not know where to begin our planning or where to work next.

The model provides a framework for the application of theory and research on learning and teaching. Instructing teachers in the principles of learning and instruction has not had much impact on the improvement of courses and curriculum. Missing has been a means for applying these principles; without some framework to call up and guide the use of this information it sits on the shelf collecting dust. What has been needed is a set of procedures or "technology" which makes use of the basic behavioral and social sciences, much as medicine and engineering use the findings of the life and physical sciences. The model of instruction and attendant planning procedures serve as one such technology.

As a third advantage, mentioned earlier, the model emphasizes an experimental approach to teaching. Our instruction does not always succeed.

If we, though, observe closely what we do and note where it works and where it does not, we will be in a position in the future to be more successful ourselves and to assist our colleagues plan effective instruction.

On the disadvantage side, this model can result in a rigid approach to teaching. Any approach presented as a step-by-step formula can restrict the ways we look at teaching and consequently render us unable to deal with interesting and anomalous situations when they arise. I have talked above, though, about the flexible ways in which the model can be used. If we remember that the approach is a way of looking at teaching and provides a set of tools to use when appropriate, then we might keep from using it in a rigid fashion.

Critics of this approach argue that teaching is not really a planned and purposeful activity; the model approach misses what teaching is all about. Teaching, rather, is a spontaneous and serendipitous activity; one which concerns for purpose and planning can stifle. This proposed disadvantage is more difficult to resolve than the first one. There is much room for disagreement over the essence of teaching and the most appropriate way to go about it. I believe any activity which has such an important place in the society, requires clarity of purposes and careful planning. You must decide for yourself if the view of teaching presented makes sense to you.

As a third disadvantage, the model can create a false expectation about the power of current theory and research to prescribe effective and efficient conditions for learning. As a framework for the application for educational research and theory, a model can give this basic information more credence than it deserves. Users of this approach to instruction and planning need to understand the limits of this information. An "experimental" attitude toward teaching can help reduce the chan e that too much hope will be put on any prescription for effective and efficient teaching.

The approach also overestimates the teacher's responsibility and underemphasizes the student's responsibility. Earlier a strong case was made for teacher responsibility in setting the conditions for learning. The point may have been overstated, because there are, indeed, many variables influencing success in learning that we as teachers cannot control. The fact remains, though, that many things do remain under our power to influence, giving us more responsibility for student learning than many of us have been willing to take in the past.

Finally, this model for course planning overestimates a teacher's time and ability to create and maintain a learning system. Certainly we have limited hours to plan our courses. The planning approach presented here does take time, maybe more than we have committed in the past. But, if the tools are used judiciously and if planning can span a number of terms, then the amount of time necessary at any one point can be limited. Ability to plan and pull off effective courses neither needs to be a stumbling block. We all have these abilities to some degree already; we could not have survived this long without them (even if only a term). The abilities of any effective teacher can be learned, in any number of ways. A package like this one on course planning is just one way.

REFERENCES

If, at some time, you want to look further into the model of instruction presented in this section, I would recommend the following three books. These works provide the basis for many of the ideas in the section.

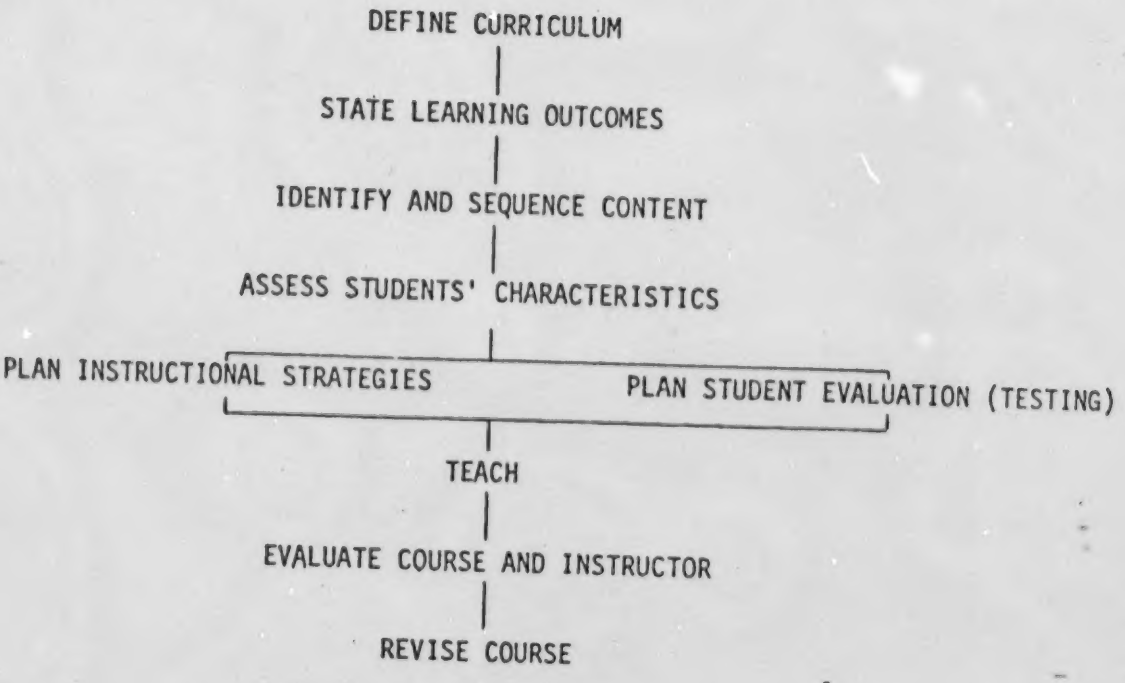
Anderson, Richard L. and Gerald Faust, Educational Psychology: The Science of Instruction and Learning, Dodd-Mead, Boston, 1973.

Davis, Robert H., Lawrence T. Alexander, and Steven L. Yelon, Learning System Design: An Approach to the Improvement of Instruction, McGraw-Hill Company, New York, 1975.

Gagne, Robert and Leslie Briggs, Instructional Design, Holt, Rinehart and Winston, 1975.

You might also be interested in a narration and bibliography on Course Development prepared for the Project on Institutional Renewal through the Improvement of Teaching. They have been taken from the Project's Resource Notebook, and are available from the Office of Instructional Development.

A MODEL OF INSTRUCTION



CURRICULUM

EXERCISE II

Define Curriculum

When finished with this exercise, you will have identified the topics which your course needs to cover and have made a tentative decision about the level at which each topic should be presented. The procedure for making these decisions involves answering a list of questions about the course and related courses.

Ask yourself the following questions about the course you have chosen to work on.

1. *In your best judgment as a specialist in your field, what major topics should be covered in this course? And, how much about each topic should students take away from the course?*
2. *What topics does the college catalog indicate will be covered, and, at what level? Does this constrain what you can cover in the course? Are other definitions of the course in existence, such as department publications or student expectations (developed via the grapevine) for what the course will cover? Do these constrain you?*
3. *Do other courses cover topics you have in mind? Is redundancy desirable (or even permitted)? Do these courses cover the topics at the same level or in the*

same way? Does this make any difference in your choice of topics?

4. *What courses "lead into" your course and what course "leads from" the course? What would be desirable overlap? Are there topics covered in earlier courses which need review or which need to be considered at a deeper level of understanding? Are there topics students must have covered if they are to succeed in later courses? What level of understanding do they need to begin these later courses?*

Your answers to these questions should help you put together a list of topics the course should cover and, for each, a statement about the level of understanding you intend. There may be other criteria you want to use in defining curriculum. These questions, though, will get you started in identifying the most important topics for your course. With this step completed, you can move on to stating course objectives and the rest of the planning process.

COURSE OUTCOMES

and

COURSE CONTENT

COMMENT

Educational Development Program
Michigan State University
East Lansing, Michigan 48823

January, 1971
Number 8

ARE OUR INSTRUCTIONAL OBJECTIVES STATED CLEARLY?

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Michigan State University's Code of Teaching Responsibilities was adopted by the Academic Council in November, 1969. The first clause of the Code asserts that:

Instructional staff members are responsible for:

1. Stating clearly the instructional objectives of each course they teach;
2. Directing their instruction toward the fulfillment of these objectives; and
3. Designing their examinations to be consistent with these objectives.

Why are instructional objectives given so preeminent a place in the Code of Teaching Responsibilities? Have instructors in the past failed to tell students what they expected of them? It would be difficult for an instructor to plan and teach a course without having some objectives in mind and most teachers probably tell students something about their goals and expectations for the course.

In our opinion, if a problem exists, it is to be found in the requirement to state objectives clearly. How clear is "clear?" How does an instructor know whether or not he has stated his objectives clearly enough?

In this Comment we shall try to answer these questions by developing an operational definition of clear instructional objectives. First we shall indicate some of the consequences of not stating objectives clearly and unambiguously. Second, we shall postulate three functions that instructional objectives should perform in the teaching-learning process. Finally, we shall suggest the characteristics or properties that an instructional objective should have in order to fulfill these functions.

Symptoms of the Problem

A recent Peanuts cartoon illustrates what can happen if instructional objectives are not stated clearly.

Lucy: What did you write for question number 5?
Linus: I said that he was one of our greatest presidents and one of our most beloved leaders.
Lucy: Do you really believe that?
Linus: No, but I've learned never to bad mouth a president on a history test!

When students are not informed what is expected of them, they try to reduce their uncertainty by "psyching out" the instructor. They spend a great deal of their time trying to learn about his idiosyncracies rather than learning course material.

Some other "symptoms" of poorly formulated objectives are:

- Students complain that the course is irrelevant; that the material is not related to their personal educational goals or to any other goals that they can recognize as being important.
- Students complain that tests are unfair: one topic is assigned; another is taught; and a third is covered on the test.
- Students complain that they do not know what to study, since no

priorities among topics are provided.

- Students complain that the course is disorganized; that the topics do not fit together; and that there is no clear direction.

Are these complaints the outcry of stupid or lazy people? Do only poor students complain? If good students do not complain, is it because they have learned how to "beat the system?" Or are these complaints possibly the result of unclear objectives?

Functions of an Instructional Objective

An instructional objective is a statement of an instructional goal. In the teaching-learning process an instructional objective should perform three functions: (1) guide the instructor in planning his instruction, so as to achieve the goal; (2) guide student learning toward the goal; and (3) provide a criterion for evaluating student achievement of the goal.

An instructional objective guides instructional planning in the same way that knowledge of his destination aids the traveler in selecting a route. Just as the traveler uses a destination as the criterion for deciding among alternative routes, an objective should provide a clear criterion for deciding among alternative instructional procedures. For example, an objective that specifies the kind of learning required of a student helps the instructor to select and arrange the conditions that will maximally facilitate that learning.

An instructional objective assists students by providing them a "target to shoot at." Most instructors agree that a student should assume some degree of responsibility for his own learning. However, if students are to discharge this responsibility they must be given adequate guidelines.

An objective should specify a learning goal so clearly that a student can use it to allocate his study time efficiently, evaluate his progress toward the goal, and determine when he has achieved the goal at the required level of proficiency.

An instructional objective provides a criterion for evaluating student achievement by specifying unambiguously how the student will be required to demonstrate what he has learned.

Properties of a Clearly Stated Objective

We have suggested that an instructional objective should be stated clearly enough so that:

1. An instructor can employ it to help make decisions in planning his instruction;
2. A student can employ it to guide his learning activities;
3. It can serve as an unambiguous criterion for evaluating student achievement.

Studies of the teaching-learning process indicate that, in order to fulfill the functions stated above, an instructional objective should have the following properties. It should include a description of:

- Behavior expected of the student after instruction.
- Test conditions under which the student will be required to demonstrate the behavior.
- Standards of minimally acceptable performance.

Behavior

An objective is a statement of an instructional outcome. When an instructor states an objective in terms of the behavior expected of a

student, he provides an unambiguous description of what he intends the outcome of his instruction to be. By "behavior" we mean any response that can be observed or measured.

In the following examples, the underlined words clearly describe student behavior:

Identify positive and negative examples of participative management.

Given an hypothesis derived from the principles of operant conditioning, the student will be able to design an experiment that . . .

From several examples of French impressionist art, the student will be able to select those that exemplify . . .

In contrast, consider the following statements of instructional outcomes:

1. Appreciates the value of democracy.
2. Grasps the significance of the concept of supply and demand.
3. Fully appreciates the importance of instructional objectives.
4. Becomes familiar with the plays of Shakespeare.
5. Understands (or really understands) scientific methods.

The underlined words are so vague as to be almost meaningless. They can be interpreted in a variety of ways and thus do not meet the needs of the student who requires a more precise statement of what is expected of him. Such words as discriminate (or distinguish between), choose (or select), identify, solve, apply, or list (the properties of) are less ambiguous. They state what the student will be doing to demonstrate that he has learned.

A good test of whether or not an objective clearly communicates an instructional outcome is an affirmative answer to the question:

> Could two qualified, independent observers, with the objective before them, observe a student performing the specified behavior and agree whether or not the statement and his performance correspond?

There is another advantage to writing instructional objectives in

behavioral terms. It enables the instructor to demonstrate to himself, and to his students, that learning has occurred. It is difficult to demonstrate learning unless there is a resultant change in behavior that can be observed or measured.

Test Conditions and Standards

In order to make your instructional intent even more clear, an objective should include, in addition to the behavior expected of the student, the test conditions under which he will be required to demonstrate the behavior, and the standards of minimally acceptable performance.

For example, consider this objective:

> "Students should be able to write an essay critically evaluating current beliefs about contraception."

It is not clear from this statement what the instructor would accept as a critical evaluation. If you were going to grade the essay, or as a student in the class you were preparing yourself to write one, you would certainly want a more precise description of what was expected.

In contrast, the following objective is more precise:

> "Students should be able to write an essay stating at least five currently held beliefs about contraceptive devices. Each belief should then be restated as a physiological principle that includes independent and dependent variables and the relationship between them. Physiological evidence should be cited that either supports or denies the validity of the principle."

If a student had been given the latter objective he would have little difficulty understanding what the instructor expected of him.

Here are two examples of objectives that include the properties stated above:

1. The student will be given a copy of several political campaign speeches that include the following types of logical errors

(types named). The student should be able to identify at least two examples of each type of error, identify the type by name, and write the statements in syllogistic form according to the procedures specified in the text.

2. The student (a graduate teaching assistant) will be given several written examples of typical instructional problems. He will correctly identify all examples that illustrate operant behavior and, choosing one, will write a plan for modifying the behavior. The plan must include the following operations: measurement of operant level, identification of a reinforcing stimulus, and management of a contingency schedule.

The ideas expressed here are not new. Most scholarly and research endeavors begin with a precise statement of a goal. The goal statement guides subsequent planning and implementation and serves as a criterion for evaluating the completed product.

EXERCISE III

Stating Course-Level Objectives

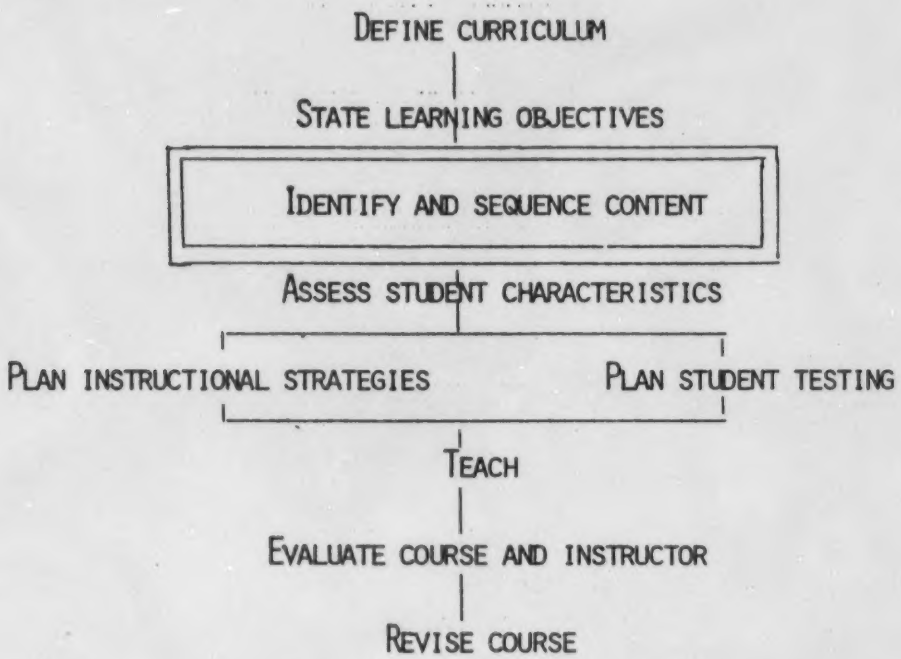
Your course will have outcomes at a number of levels: the course, unit, class session, individual exercise. You may or may not want to express these outcomes as objectives (we will talk about this issue in the session). But, you will want to state in objective form the broader course outcomes as a guide for your own planning and students' learning.

Take some time before going on and identify the outcomes you have in mind for your course. State these outcomes or objectives. Do not worry about the form of your objectives at this point. You may want to try out the ideas in the Alexander and Abedor article.

You might state one objective for each topic identified in Exercise II. Or, develop one to express the major outcome of each unit of the course.

COURSE CONTENT

I. RELATIONSHIP OF COURSE CONTENT TO OTHER COMPONENTS OF THE INSTRUCTIONAL PROCESS.

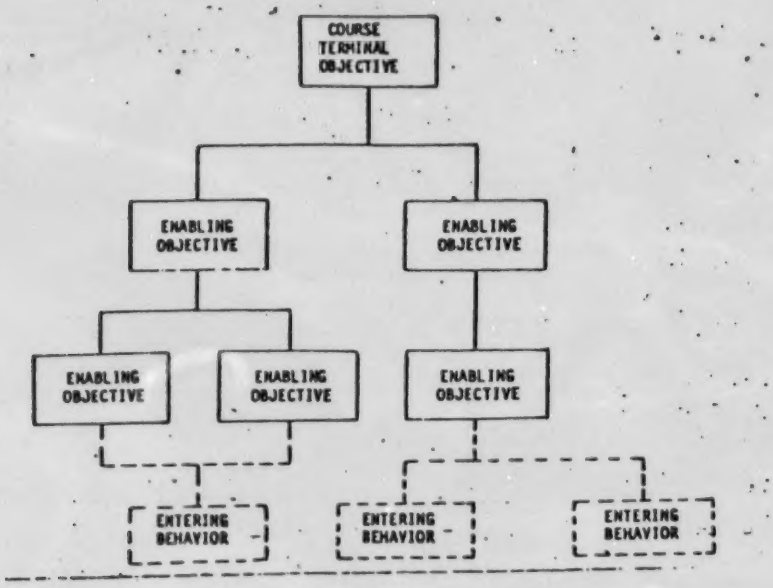


A. AFTER COURSE AND UNIT OBJECTIVES HAVE BEEN WRITTEN, COURSE CONTENT CAN BE DEFINED. COURSE CONTENT INCLUDES ALL OF THE KNOWLEDGE, SKILLS, ATTITUDES STUDENTS WILL NEED TO LEARN TO BE ABLE TO ACCOMPLISH THE OBJECTIVES THAT HAVE BEEN STATED. THUS, DEFINING CONTENT IS REALLY A TWO-STEP PROCEDURE: FIRST, ASK "WHAT DO I WANT STUDENTS TO BE ABLE TO DO AFTER A PARTICULAR UNIT OF INSTRUCTION?" (STATING INSTRUCTIONAL OBJECTIVES), AND SECOND, ASK "WHAT DO THEY NEED TO KNOW TO BE ABLE TO DO IT?" (DEFINING CONTENT BY TASK DESCRIPTION AND TASK ANALYSIS.) DEFINING CONTENT IS A MATTER OF IDENTIFYING THE ENABLING OBJECTIVES OF THE UNIT OF INSTRUCTION.

B. TASK DESCRIPTION AND TASK ANALYSIS CAN BE DONE AT ANYTIME IN THE INSTRUCTIONAL PROCESS WHEN YOU WANT TO KNOW "HOW A TASK IS PERFORMED" AND "WHAT KNOWLEDGE, SKILL, OR ATTITUDE IS NECESSARY TO PERFORM IT."

II. COURSE CONTENT AS ENABLING OBJECTIVES

A. TASK DESCRIPTION AND TASK ANALYSIS IDENTIFY CONTENT AS ENABLING OBJECTIVES AND RELATIONSHIPS AMONG COURSE/UNIT OBJECTIVES, ENABLING OBJECTIVES (CONTENT), AND ENTERING BEHAVIOR (NECESSARY PREREQUISITES TO COURSE/UNIT).



B. EXAMPLE

TOPIC: THEORY OF CONSERVATION OF ENERGY

UNIT OBJECTIVE: TO APPLY OHM'S LAW

CONTENT (ENABLING OBJECTIVES):

(A) CONCEPT OF ELECTRICAL CHARGE

ELEMENT 1: AN ELECTRIC CHARGE IS PRODUCED BY FRICTION
" 2: THE ELECTRON IS THE BASIC UNIT OF CHARGE
" 3: THE ELECTRON IS AN IMPRACTICAL UNIT OF CHARGE
" 4: THE COULOMB IS THE PRACTICAL UNIT OF CHARGE
" 5: CURRENT IS A FLOW OF CHARGE

(B) CONCEPT OF ELECTRICAL CURRENT

ELEMENT 5: CURRENT IS A FLOW OF CHARGE
" 6: CURRENT IS MEASURED IN COULOMBS PER SECOND
" 7: ONE COULOMB PER SECOND IS CALLED AN AMPERE
" 8: WHEN CURRENT FLOWS, WORK IS DONE
" 9: ENERGY IS USED WHEN WORK IS DONE
" 10: ENERGY MUST BE SUPPLIED FOR CURRENT TO FLOW

(C) CONCEPT OF ELECTROMOTIVE FORCE

ELEMENT 10: ENERGY MUST BE SUPPLIED FOR CURRENT TO FLOW
" 11: ELECTROMOTIVE FORCE IS A MEASURE OF THE RATE AT WHICH ENERGY IS SUPPLIED
" 12: ENERGY IS MEASURED IN JOULES
" 13: ELECTROMOTIVE FORCE IS THE RATE OF SUPPLY OF ENERGY PER UNIT CURRENT
" 14: THE UNIT OF ELECTROMOTIVE FORCE IS THE VOLT

III. SEQUENCING OF CONTENT

A. THERE IS NO "CORRECT" WAY TO SEQUENCE THE CONTENT YOU HAVE IDENTIFIED. THERE ARE A NUMBER OF WAYS TO DETERMINE APPROPRIATE SEQUENCE. RESEARCH ON SEQUENCING HAS BEEN LIMITED AND DOES NOT AT THIS TIME POINT TO AN OPTIMAL APPROACH FOR ALL DISCIPLINES. THE BEST SEQUENCE FOR A PARTICULAR UNIT, COURSE, OR CURRICULUM DEPENDS ON THE NATURE OF THE SUBJECT MATTER AND THE PARTICULAR TASKS (I.E. OBJECTIVES) INVOLVED.

B. AS AN OPTIMAL STRATEGY, THE TEACHING OR CONTENT MIGHT FOLLOW ANY OF THE FOLLOWING SEQUENCES (OR COMBINATION OF THEM)*

1. WORLD-RELATED SEQUENCES - I.E. RELATIONSHIPS AS THEY EXIST - SPATIAL, TEMPORAL, PHYSICAL, E.G. CLOSEST TO FARTHEST, EAST TO WEST, DISTANT TO PRESENT

2. CONCEPT-RELATED SEQUENCES - I.E. THE WAY THE CONCEPTUAL WORLD IS ORGANIZED - LOGICAL STRUCTURE, E.G. BIOLOGICAL STRUCTURE VS. FUNCTION

3. INQUIRY-RELATED SEQUENCES - I.E. LOGIC OR METHOD IN AN AREA . . .

4. LEARNING-RELATED SEQUENCES - I.E. EMPIRICAL PRE-REQUISITE, FAMILIARITY, DIFFICULTY, INTEREST, DEVELOPMENT, INTERNALIZATION

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*SEE POSNER, GEORGE J. AND STRIKE, KENNETH A., A CATEGORIZATION SCHEME FOR PRINCIPLES OF SEQUENCING CONTENT, REVIEW OF EDUCATIONAL RESEARCH, 46 (4), 1976, 665-690.

5. UTILIZATION-RELATED SEQUENCES - I.E. SOCIAL, PERSONAL, CAREER CONTEXTS, PROCEDURAL, FREQUENCY OF UTILIZATION

6. IMPLEMENTATION-RELATED SEQUENCES - I.E. MATERIALS AND FACILITIES, TIME SCHEDULES, TEACHER INTEREST AND COMPETENCE

C. STUDENTS MAY LEARN SEQUENCE AND RESULTANT COGNITIVE STRUCTURE IN ADDITION TO CONTENT.

D. EXAMPLE-LEARNING RELATED SEQUENCE

1. Objective: Given a wide variety of subjects, for example (list here), the student will photograph them correctly according to judgment of instructor.

2. Types of Learning

   a. Principle (Heuristic): Consider the following characteristics of the subject in this order: amount of reflected light; movement; depth of field.

   b. Principle: The amount of light admitted is directly related to size of diaphragm opening and inversely related to speed of shutter. (more open-more light; and conversely) (slower-less light; and conversely)

   c. Principle: Depth of field is inversely related to size of diagragm opening. (more open-less depth; and conversely)

   d. Skill: How to adjust shutter

   e. Skill: How to open diaphragm

   f. Light

   g. Diaphragm

   h. Shutter speed scale

   i. Depth of field

   j. Near point

   k. far point

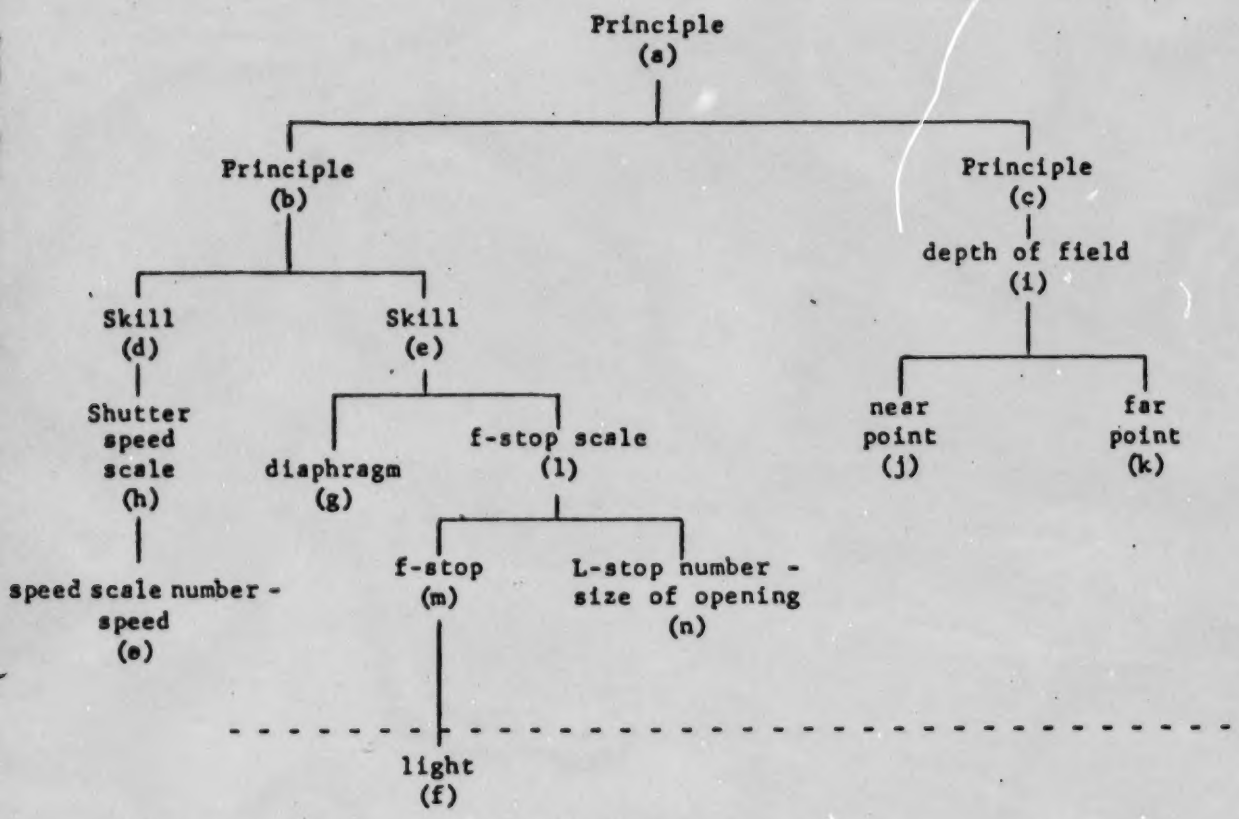
   l. f-stop scale

   m. L-stop

   n. L-stop number-size of opening

   o. speed scale number-speed

3. Sequence


Principle
(a)
Principle
(b)
Principle
(c)
depth of field
(i)
Skill
(d)
Skill
(e)
near
point
(j)
far
point
(k)
Shutter
speed
scale
(h)
diaphragm
(g)
f-stop scale
(l)
speed scale number -
speed
(e)
f-stop
(m)
L-stop number -
size of opening
(n)
light
(f)

A. PROCEDURE

1. Choose Instructional Objective

   Decide on a strategy for moving through your objectives, e.g. course-unit-lesson, beginning to end, most important or complex first .

   All objectives should eventually be analyzed for content, but since this can be a time consuming process, either work from the beginning of the course to the end or choose objectives which are complex or extremely important for students to achieve.

2. Describe the Task

   Ask the question: "How does someone actually go about doing the task called for in the objectives?"

   In other words what are the steps a person would go through to accomplish the task. Some objectives suggest tasks which involve only one step; whereas others are more complex and call for any number of discrete mental and/or physical acts to complete the task.

3. Analyze the Task for Content

   Ask the question: "What does someone need to know to be able to perform each step in the task?"

   By answering this question you are actually defining the content necessary to cover (or assume it had been learned previously) if students are to be able to accomplish the objective.

4. Check for Gaps and Irrelevancies

   Ask two questions: "If a student knew all the content identified, would he be able to perform each step and the objective chosen?" and "Have I listed content which a student really does not need to know to accomplish the objective?"

   If the answer to the first is "No." then one or more gaps exists in the content. And, if "Yes" to the second, then one or more items of irrelevant information have been identified. This step is a review of your task analysis.

5. Sequence Content

   Decide on Sequencing Strategy(ies).

EXERCISE III con't

Stating Unit Objectives and Defining Unit Content

Take one unit of your course and state the major outcome(s) in objective form. You may have already done this in Exercise III.

For each outcome stated, identify essential content using the task description/task analysis procedure. Identify content you will need to cover in the unit and the essential prerequisites.

Choose a sequencing strategy and order the content for presentation in the unit.

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ASSESSING STUDENT CHARACTERISTICS

I. Categories of Student Characteristics

A. Aptitude and Achievement Scores

1. Examples: SAT, CLEP, GRE, MCAT, University Placement Tests, Tests of Intellectual Development

2. Assessment Methods: Student Self-Report, University Data Services

3. Use of Information: Advising as to success in course, amount of structure and organization, pacing, concrete vs. abstract presentation.

B. Entry Level of Achievement

1. Knowledge and skills relevant to the objectives of the course/unit/lesson. Example: Computational skills for a statistics course.

2. Assessment Methods: Student self-report, pre-test, result of previous course(s)

3. Use of Information: Alter objectives, remediation, enrichment.

C. Attitudes, Beliefs, and Values

1. Characteristics which result in orientation to subject matter and work habits which influence learning. Examples: Academic self-concept, "stick-to-itness," "beliefs about the subject.

2. Assessment Methods: Student self-report, interview, observation, standardized and self-developed instruments.

3. Use of Information: Assessment and development of affective objectives, advise of satisfaction and success in course, special attention to some students.

D. Learning Style

1. Characteristic way a student processes information and/or participates in learning activities. Example: as a learner, student might be independent, collaborative, dependent, avoidant, competitive, or participative.

2. Assessment Methods: Student self-report, observation, learning style inventory.

3. Use of Information: Understanding of student behavior, design methods of instruction to use or to alter student's preferred style.

E. EXPERIENCES, INTERESTS, ABILITIES, AND ASPIRATIONS

1. Characteristics which determine course/unit/lesson's relevance and worth to a student. Example: two year experience as a juvenile case worker prior to a course in juvenile justice system.

2. Assessment Methods: Student self-report on beginning-of-course questionnaire, interviews, informal conversations

3. Use of Information: Relate course material to experiences, interests, and aspirations as a way to make it meaningful, insure concrete experience before presenting abstractions, use skills and experiences in the course.

F. DEMOGRAPHIC INFORMATION

1. Examples: Age, academic status, work status, residence, degree program, class/work schedule.

2. Assessment Method: Self-report questionnaire, oral introduction at first class session.

3. Use of Information: Assess instructional methods and activities, schedule extra-class activities.

II. EXAMPLE OF STUDENT CHARACTERISTIC ASSESSMENT: STUDENT LEARNING STYLE

A. ON THE FOLLOWING PAGES, YOU WILL FIND AN INVENTORY TO MEASURE STUDENT LEARNING STYLES, SCORING INSTRUCTIONS, AND A DESCRIPTION OF THE STYLES MEASURED BY THE INVENTORY.

Try out this approach to assessing this student characteristic by completing the inventory yourself. When you have finished, score the inventory and then check the description of the styles. Do not read these descriptions before you complete the inventory.

STUDENT LEARNING STYLES QUESTIONNAIRE: GENERAL FORM *

The following questionnaire has been designed to help you clarify your attitudes and feelings toward the courses you have taken in college and to identify your preferred learning style(s). Remember, formulate your answers with regard to your general attitudes and feelings toward your courses.

Write your answers on the enclosed questionnaire. To the left of each question number, write the number that best explains how you feel about the statement as follows:

Mark *1* if you *strongly disagree* with the statement.

Mark *2* if you *moderately disagree* with the statement.

Mark *3* if you are *undecided.*

Mark *4* if you *moderately agree* with the statement.

Mark *5* if you *strongly agree* with the statement.

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1. Most of what I know, I learned on my own.
2. I have a difficult time paying attention during class sessions.
3. I find the ideas of other students relatively useful for helping me to understand the course material.
4. I think a teacher who lets students do whatever they want is not doing his job well.
5. I like other students to know when I have done a good job.
6. I try to participate as much as I can in all aspects of a course.
7. I study what is important to me and not necessarily what the instructor says is important.
8. I feel that I have to attend class rather than feeling that I want to attend.
9. I think an important part of classes is to learn to get along with other people.
10. I accept the structure a teacher sets for a course.
11. To get ahead in class, I think sometimes you have to step on the toes of the other students.
12. I do not have trouble paying attention in classes.
13. I think I can determine what the important content issues are in a course.
14. If I do not understand course material, I just forget about it.
15. I think students can learn more by sharing their ideas than by keeping their ideas to themselves.
16. I think teachers should clearly state what they expect from students.
17. I think students have to be aggressive to do well in school.
18. I get more out of going to class than staying at home.
19. I feel that my ideas about content are often as good as those in a textbook.
20. I try to spend as little time as possible on a course outside of class.

*Developed by Anthony F. Grasha and Sheryl Riechmann at the University of Cincinnati,; from Bergquist, William H., and Steven R. Phillips, A Handbook for Faculty Development, Council for the Advancement of Small Colleges; Washington, 1975.

21. I like to study for tests with other students.
22. I like tests taken right out of the book.
23. I feel that I must compete with the other students to get a grade.
24. I attend classes because I want to learn something.
25. I am confident in my abilities to learn important course material.
26. School does not really interest me.
27. I think students should be encouraged to work together.
28. I feel that facts presented in textbooks and lectures are correct.
29. I like the teacher to notice me.
30. I feel that classroom activities are generally interesting.
31. I like to think things through for myself before a teacher lectures on course material.
32. I seldom get excited about material covered in a course.
33. I prefer not to work alone on assignments.
34. Before working on a class project, I try to get the approval of the instructor.
35. To do well in a course, I have to compete with the other students for the teacher's attention.
36. I do my assignments before reading other things that interest me.
37. I do not like a lot of structure in a class.
38. I have given up trying to learn anything from going to class.
39. I like to hear what other students think about the issues raised in class.
40. I think teachers are the best judges of what is important in a course.
41. During class discussions I feel that I have to compete with the other students to get my ideas across.
42. I think classes are very worthwhile.
43. I work on class related projects (e.g., studying for exams, preparing term papers) by myself.
44. I feel that classroom activities are generally boring.
45. I prefer to work in groups rather than alone on class projects.
46. I try my best to do assignments the way the professor says they should be done.
47. I like to see if I can get the answers to problems or questions before anybody else in class does.
48. I am eager to learn about areas covered in class.
49. I do assignments my own way without checking with other students about how they are going to do them.
50. I do not feel that I miss anything if I cut class.
51. I like to talk to other students outside of class about the ideas and issues raised in class.
52. I tend not to think or work on problems or issues in a field unless they were first covered in the text or lectures.
53. I think a student is hurting himself if he shares his notes and ideas with other students before an exam.
54. I feel that I can really learn something in a course.
55. I feel that too much assigned work keeps students from developing their own ideas.
56. I am in school only to get a degree.

57. I try to get to know other students in my classes on a personal level.
58. I think too much class discussion prevents the teacher from covering enough required material.
59. I like to know that I have done better than other students in my class.
60. I do my assignments whether I think they are interesting or not.
61. My ideas about content issues are often as good as those of the instructor.
62. I sit where the teacher is unlikely to notice me.
63. I feel that students and teachers should develop the kind of relationship where a student can tell his teacher if he feels a course is not going well.
64. I feel that I can learn what is important by doing what the professor says.
65. I think students should be graded according to how well they do in a class.
66. I try to do the best that I can in my courses.
67. I do not like a teacher to tell me what I have to learn.
68. I study just hard enough to get by in a course.
69. I like courses where students are encouraged to discuss course material.
70. I seldom try to learn things related to the course that are not covered in the text or lectures.
71. I like to know how well the other students are doing on exams.
72. I feel that I can get something out of going to class.
73. I like courses where students are allowed to pursue topics that interest them.
74. I prefer that the teacher never calls on me.
75. I think learning should be a cooperative effort between faculty and students.
76. I think the teacher should emphasize the content that I must learn.
77. I only help other students when I feel it will not hurt me.
78. I sit where I can be sure to hear the professor and see what he writes.
79. If a topic raised in class interests me, I will go out on my own to find out more about it.
80. I think one of the most important things about a course is how easy it is for me to get a good grade.
81. I try to help other students when they have a hard time understanding course material.
82. I enjoy class sessions that are highly organized.
83. I do not like the instructor to deviate from his lectures.
84. I work on reading assignments until I feel I understand the material.
85. I have my own ideas about how a course should be run.
86. I feel that school is not relevant to what I want to do when I graduate.
87. I feel a responsibility to help other students learn.
88. I try my best to write in my notes everything the teacher says.
89. I try to do assignments better than other students.
90. I do my assignments as soon as possible after assignments are made.

SCORE SHEET
STUDENT LEARNING STYLES QUESTIONNAIRE: GENERAL FORM

Instructions:

The numbers below represent the numbers of the statements in the questionnaire. To the right of each number place the number (1 to 5) that you assigned it on the questionnaire. Add the numbers in each column. The relative totals will indicate your preferred learning style(s) as described on the next page.

Independent	Avoidant	Collaborative
1	2	3 .....
7	8	9 .....
13	14	15 .....
19	20	21 .....
25	26	27 .....
31	32	33 .....
37	38	39 .....
43	44	45 .....
49	50	51 .....
55	56	57 .....
61	62	63 .....
67	68	69 .....
73	74	75 .....
79	80	81 .....
85	86	87 .....
Total	Total	Total .....

Dependent	Competitive	Participant
4	5	6 .....
10	11	12 .....
16	17	18 .....
22	23	24 .....
28	29	30 .....
34	35	36 .....
40	41	42 .....
46	47	48 .....
52	53	54 .....
58	59	60 .....
64	65	66 .....
70	71	72 .....
76	77	78 .....
82	83	84 .....
88	89	90 .....
Total	Total	Total .....

STUDENT LEARNING STYLES

Independent:

This response style is characteristic of the student who likes to think for himself. He prefers to work on his own, but he will listen to the ideas of others in the classroom. He learns the content he feels is important and is confident in his learning abilities.

Avoidant:

This response style is typical of a student who is not interested in learning course content in the traditional classroom. He does not participate with students and teachers in the classroom. He is uninterested or overwhelmed by what goes on in classes.

Collaborative:

This style is typical of the student who feels he can learn the most by sharing his ideas and talents. He cooperates with teachers and peers and likes to work with others. He sees the classroom as a place for social interaction as well as content learning.

Dependent:

This style is characteristic of the student who shows little intellectual curiosity and who learns only what is required. He sees teacher and peers as sources of structure and support. He looks to authority figures for guidelines and wants to be told what to do.

Competitive:

This response style is exhibited by the student who learns material in order to perform better than others in the class. He feels he must compete with other students in the class for the rewards of the classroom, such as grades or teacher's attention. He views the classroom as a win-lose situation, where he must always win.

Participant:

This style is characteristic of the student who wants to learn course content and likes to go to class. He takes responsibility for getting the most out of class and participates with others when told to do so. He feels that he should take part in as much of the class related activity as possible but he does little that is not part of the course outline.

ASSESSING STUDENT CHARACTERISTICS

WORKSHEET

COURSE/UNIT/LESSON: _____

INFORMATION TO BE COLLECTED:	Method of Collection	Time of Collection
Achievement		
Aptitude		
Entering Level of Knowledge		
Attitudes		
Beliefs		
Values		
Learning Style		
Aspirations		
Interests		
Abilities		
Course related experience		
Reason for taking course		
Demographic		
Age		
Commute/Campus		
Female/Male		
Prior college experience		
Work--number of hours		
Other _____		
Other _____		

HOW WILL YOU USE THE INFORMATION IN EACH CATEGORY IN PLANNING AND IMPLEMENTING YOUR COURSE:

(Continue answer on reverse if necessary)

REFERENCES

The references listed at the end of the first section ("Model for Instructional Planning") each treat the assessment of characteristics. In addition, I recommend the following book.

Messick, Samuel and Associates, Individuality in Learning, Jossey-Bass: Washington, 1976.

EXERCISE IV

Assessing Student Characteristics

Use the worksheet on the next page to plan the assessment of student characteristics for your course.

Decide what types of information you will collect, the methods you will use to collect each type, and the ways in which you will use the information you gather.

INSTRUCTIONAL STRATEGIES

CHOOSING INSTRUCTIONAL STRATEGIES

Various strategies of instruction are used separately or in combination in order to achieve particular learning outcomes. The effectiveness and efficiency of an instructional strategy in achieving these outcomes depend upon the instructional operations it contains. Strategies and operations have been listed below. Also, certain variables should be considered in selecting and combining instructional strategies. These have also been listed.

Instructional Modes	Instructional Operations
Lecture	Inducing a Learning Set or Establishing a Learning Context
Instructor-Centered Discussion	Delivering Information
Student-Centered Discussion	Providing Practice
Texts and Other Reference Material	Providing Feedback
Self-Instructional Materials	Explaining, Demonstrating, Modeling
Laboratory	Questioning and Answering Questions
Simulation Games, Role-Playing	Evaluating
Independent Study	
Tutorial	
Field Experience	

Variables

Student Characteristics

Type and Level of Learning Outcomes

Administrative and Logistic Factors

Constraints (Physical and Psychological)

Subject Matter Characteristics

INSTRUCTIONAL MODES

Lecture

Lecturing involves a single instructor teaching a group of students mainly by verbal exposition. It may include audio/visual aids, demonstrations, questions to and from the audience, brief discussions, brief practice exercises, and testing. The principal uses of lecturing are:

A. To provide a framework for other sources of information and guidance as to their location;

B. To furnish information and viewpoints which are not readily available, or are not available in an appropriate form;

C. To enthuse students or to stimulate their thinking;

D. To encourage a critical attitude;

E. To provide an appropriate model of such qualities and attitudes as precision, clarity of thought and expression, authority and humility;

F. To summarize the results of group activities.

Instructor-Centered Discussion

Student-Centered Discussion

A discussion involves a teacher engaging with two or more students in a cooperative examination of views on a topic in order to illuminate the relevant issues and contribute to the students' understanding. The purpose of discussion is to permit students to gain experience with a variety of problems. The difference between instructor-centered and student-centered discussion depends upon the role or functions performed by the participants. The two modes are distinguished by (1) who does the talking; (2) who provides the information; (3) who structures the

activities; (4) who provides feedback and criticism; (5) the degree of freedom of expression permitted; and (6) the degree to which group norms are permitted to operate.

Texts and Other Reference Material

The purpose of these materials is to provide a variety of sources of information and viewpoints which permit a student to go beyond his assignments and to choose from among a number of authors those who communicate best to him.

Self-Instructional Materials

These consist of "packages" or modules which include a variety of media with which the student interacts. They usually involve little or no teaching supervision. Examples of self-instructional modules are programmed texts, computer assistance programs, audio/visual/workbook programs. The purpose of self-instructional materials is to permit each student to study at a rate most comfortable and productive for him. The amount of repetition is under the student's control.

Laboratory

Laboratory modes involve students' activity in manipulating materials and engaging in procedures that are characteristic of the subject matter discipline. The purpose of the mode is to provide active and individualized experience.

Simulation Games; Role-Playing

Simulation games involve students interacting with a model of real-life phenomena. The model may be a physical or functional representation of the phenomena. The purpose is to learn about the real-life phenomena.

Independent Study

Independent Study involves projects that are planned, directed and conducted primarily by students, either individually or in small groups. The study is supervised by the teacher and the product is usually a paper or some other type of report. The purpose is to gain experience in independent learning.

Tutorial

Involves two or more students studying together. One student, who is more knowledgeable or skilled in the subject matter, acts as teacher. The purpose is to provide a teacher who can closely identify with the level of skill and needs of the student.

Field Experience

Involves supervised on-the-job training in a real-life situation. The purpose is to provide the student with knowledge about and experience in dealing with characteristics of the real-life situation.

INSTRUCTIONAL OPERATIONS

An instructional operation is a procedure which has been demonstrated empirically to influence the learning process.

Inducing a Learning Set or Establishing a Learning Context

These are procedures which attract and focus students' attention on the subject matter to be covered, arouse their interest and help them direct their efforts toward achieving the desired learning goals.

Delivering Information

Information can be delivered by a variety of media: orally; print; still and moving pictures; TV; audio-tape; from a variety of sources.

Providing Practice

The practice should be relevant; that is, it should be conducted under the conditions, exercise the behavior, and require the standards specified in the learning objectives. Examples of practice include answering questions, discriminating among examples, generating examples, solving problems, etc.

Providing Feedback

Feedback is information about student performance and should occur as soon after practice as possible. The feedback information should be structured in form and content so that the student knows whether or not he has achieved the learning objective and, if not, he can identify the discrepancies and the reason for them.

Explaining, Demonstrating, Modeling

A demonstration shows how to perform a task. An explanation is a verbal description or analysis of the task which should include the following: the conditions under which it is performed; the cues to look for; the actions to perform; the strategies to use; the standards to attain; the relationships among parts, etc. The purpose of a demonstration or explanation is to provide enough information to the student so that he can learn independently of the teacher, i.e., he can perform the task, judge the quality of the performance, identify errors and determine how to improve.

Questioning and Answering Questions

Questions stimulate and motivate students to learn by arousing curiosity and by indicating learning goals. Instructors should respond to students' questions so as to create a climate in which they feel free to explore a topic, evaluate their ideas and degree of comprehension, and even to make errors.

Evaluating

The purpose of evaluating is to provide information upon which decisions can be made. Such decisions relate to whether or not a student has achieved learning objectives, how students are progressing in their learning, and how effective and efficient are the instructional procedures. Both students and teachers need this information.

MOST INSTRUCTIONAL OPERATIONS CAN BE PERFORMED IN ALL MODES OF INSTRUCTION BY EITHER THE TEACHER OR THE STUDENTS BY EMPLOYING VARIOUS TYPES OR COMBINATIONS OF MEDIA.

VARIABLES TO CONSIDER IN CHOOSING INSTRUCTIONAL MODES

Empirical research studies indicate that the effectiveness and efficiency of different modes of instruction in producing student learning depend upon the interaction of five categories of variables: characteristics of students; learning outcomes; administrative and logistical factors; constraints; subject matter characteristics.

Student Characteristics

A. Familiarity with field of study

B. Level of student skills (study, test taking, reading, math, writing)

C. Level of relevant entry skills (prerequisite knowledge and abilities--not previous courses)

D. Need for affiliation

E. Need for role models

F. Preferences

G. Heterogeniety among students in background experiences, aspirations, knowledge and skills

Type and Level of Learning Outcomes

A. Cognitive: knowledge

B. Cognitive: concept learning

C. Cognitive: principle learning

D. Cognitive: problem solving

E. Cognitive: problem sensing

F. Cognitive: critical thinking

G. Motor skills

H. Attitudes (e.g., toward subject matter, toward authority)

I. Motivation (e.g., satisfaction in solving challenging problems; desire for further learning, for expending effort)

J. Responsibility (e.g., for own learning, for independent activity)

K. Group skills (e.g., interpersonal, leadership)

L. Learning how to learn

Administrative and Logistic Factors

A. Degree of control teacher has over course design

B. Amount of time available for course

C. Curriculum or professional requirements

D. Cost

Constraints (Physical and Psychological)

A. Number of students

B. Size of room

C. Availability of instructional aids (hardware and software)

D. Teacher's familiarity with, skill in performing, or predilection for using, the various instructional operations.

E. Traditional ways of teaching a course

Subject Matter Characteristics

A. Hierarchically organized

B. Continually changing

C. Number of different, and concurrent, schools of thought or theories

D. Whether or not knowledge in the field is standard and agreed upon

In most courses there are several different learning goals, and several different levels of goals, i.e., knowledge acquisition, critical thinking, attitudinal, motor skills. The teacher's first task is to select a combination of modes of instruction that will achieve an optimal balance among these goals. The teacher's second task is to design each mode so that it incorporates all of the necessary instructional operations. Information derived from empirical research helps the teacher in these tasks.

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Experiential Learning

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EXERCISE V

Choosing Instructional Strategies

Select the instructional strategies and techniques you will use to teach the unit for which you have developed objectives and content.

In selecting methods, consider each objective and content point (separately). They may require different methods.

Plan the strategy to the extent you can at this time. Consider each of the instructional operations in your planning.

TESTING AND GRADING

PLANNING A TEST

1. DECIDE HOW TEST IS TO BE USED (PURPOSE)
2. DECIDE WHAT TO TEST (OUTCOMES)
   - A. ASPECTS OF ACHIEVEMENT
   - B. COMPLEX VS. EFFICIENT TASKS
   - C. CONTENT (IMPORTANT OUTCOMES)
   - D. DIFFICULTY
3. DECIDE WHEN TO TEST (FREQUENCY AND TIMING)
4. DECIDE ON TYPE OF TEST AND TYPE OF ITEM (OUTCOME MEASURE)
   - A. ESSAY
     1. RESTRICTED RESPONSE
     2. EXTENDED RESPONSE
     3. ORAL
   - B. OBJECTIVE
     1. MULTIPLE-CHOICE
     2. TRUE-FALSE
     3. MATCHING
     4. CLASSIFICATION
     5. SHORT ANSWER
   - C. PROBLEM/PERFORMANCE
     1. CONTINUOUS OBSERVATION
     2. RATING SCALE
     3. CHECKLIST
     4. PEER APPRAISAL
5. DECIDE ON HOW LONG TEST SHOULD TAKE (NUMBER OF QUESTIONS AND/OR MINUTES)
6. DECIDE ON MEANS AND FORMAT FOR PRESENTING TEST (TESTING SITUATION)

RULES OF THUMB
ESSAY, OBJECTIVE AND PERFORMANCE TESTS

Essay Tests

Rules for construction:

1. Use essay questions to measure complex learning outcomes only.
2. Relate the questions as directly as possible to the learning outcomes being measured.
3. Formulate questions which present a clear, definite task to the student.
4. Do not permit students a choice of questions unless the learning outcome requires it.
5. Provide ample time for answering and give suggested time limits for each question.

Rules for scoring:

1. Evaluate answers to essay questions in terms of the learning outcomes being measured.
2. Score restricted response answers by the point method, using a model answer as a guide.
3. Grade extended response answers by the rating method, using clearly defined criteria as a guide.
4. Evaluate all of the students' answers to one question before proceeding to the next question.
5. Evaluate students' answers to essay questions anonymously.
6. Have two or more persons grade each answer, wherever possible.

Objective Tests

Multiple choice items:

Rules for construction:

1. Design each item to measure an important learning outcome.
2. Present a single, clearly formulated problem in the stem of the item.
3. State the stem of the item in simple, clear language.
4. Put as much of the wording as possible in the stem of the item.
5. State the stem of the item in positive form, wherever possible.
6. Emphasize negative wording whenever it is used in the stem of an item.
7. Make certain that the intended answer is correct or clearly best.
8. Make all alternatives grammatically consistent with the stem of the item and parallel in form.
9. Avoid verbal clues which might enable students to select the correct answer or to eliminate an incorrect alternative.
   (a) Similarity of wording in both the stem and the correct answer is one of the more obvious clues. Key words in the stem may be unintentionally repeated verbatim in the correct answer, a synonym may be used, or the words may simply sound or look alike.
   (b) Stating the correct answer in textbook language or stereotyped phraseology may cause the student to select it because it looks better than the other alternatives, or because he vaguely recalls having seen it before.
   (c) Stating the correct answer in greater detail may provide a clue. Also, when the answer is qualified by modifiers which are typically associated with the true statements (e.g., sometimes, may, usually), it is more likely to be chosen.

(d) Including absolute terms in the distracters enables students to eliminate them as possible answers, because such terms are commonly associated with false statements (e.g., always, never, all, none, only). This makes the correct answer obvious or at least increases the chances of guessing it.
(e) Including two responses that are all-inclusive makes it possible to eliminate the other alternatives, since one of the two obviously must be the correct answer.
(f) Including two responses that have the same meaning makes it possible to eliminate them as potential answers. If two alternatives have the same meaning and only one answer is to be selected, it is fairly obvious that both of them must be incorrect.

10. Make the distracters plausible and attractive to the uninformed.
(a) Use the common misconceptions, or common errors, of students as distracters.
(b) State the alternatives in the language of the student.
(c) Use good sounding words (e.g., accurate, important, etc.) in the distracters, as well as in the correct answers.
(d) Make the distracters similar to the correct answer in both length and complexity of wording.
11. Vary the relative length of the correct answer to eliminate length as a clue.
12. Avoid use of the alternative "all of the above" and use "none of the above" with extreme caution.
13. Vary the position of the correct answer in a random manner.
14. Control the difficulty of the item either by varying the problem in the stem or by changing the alternatives.
15. Make certain each item is independent of the other items in the test.
16 Use an efficient item format.

True-False Items:

Rules for construction:

1. Include only one central significant idea in each statement.
2. Word the statement so precisely that it can be judged unequivocally true or false.
3. Keep the statements short and use simple language structure.
4. Use negative statements sparingly and avoid double negatives.
5. Statements of opinion should be attributed to some source.
6. Avoid extraneous clues to the answer.

Matching Items:

Rules for construction:

1. Include only homogeneous material in each matching item.
2. Keep the lists of items short and put the brief responses on the right.
3. Use a larger, or smaller, number of responses than premises, and permit the responses to be used more than once.
4. Specify in the directions the basis for matching and indicate that each response may be used once, more than once, or not at all.

Short Anser Items:

Rules for construction:

1. State the item so that only a single, brief answer is possible.
2. Start with a direct question and switch to an incomplete statement only when greater conciseness is possible.

3. The words to be supplied should relate to the main point of the statement.
4. Place the blanks at the end of the statement.
5. Avoid extraneous clues to the answer.
6. For numerical answers, indicate the degree of precision expected and the units in which they are to be expressed.

Problem/Performance Tests

Rules for construction and use:

1. Clearly define the skill(s) to be observed (these may be thinking skills, interpersonal skills or physical skills). These should match your course objectives.
2. Select a natural or simulated situation in which to observe the performance.
3. Specify task elements of greatest relevance to the quality of the performance, for example, speed of performance, accuracy, number and seriousness of procedural errors, errors in following instructions, selection of proper materials or techniques, coherence and appropriateness of sequence of performance, intensity and force of the performance.
   Select elements in proportion to emphasis given in the course.
   Judge whether these elements can be accurately and efficiently evaluated.
4. Problems in performance evaluation include a) tendency to use exclusively precise categories (especially with rating scales and checklists) and b) counter-tendency to use overly broad and vague categories (especially with anecdotal records and peer evaluation).
5. Common rating errors include a) being too lenient because of the difficulties of rating, b) rating everyone near the average performance and c) letting performance of one skill effect rating on other skills or elements of performance (the Halo effect).
6. In training other raters (e.g., clinical supervisors, lab assistants, peer raters) develop a common frame of performance, common set of criteria, and common procedures. Do this by a) practice sessions for raters, b) review and comparison among raters, c) computation of inter-rater reliabilities scores and d) replacement of inconsistent raters or raters who cannot work with common frame of reference.
7. Special situations for performance evaluation might include leaderless groups, problem-solving teams, individual and group role playing, actual performance situations.

Guidelines for Reviewing and Editing Items

1. Does each test item measure an important learning outcome included in the table of specifications?
2. Is each item type appropriate for the particular learning outcome to be measured?
3. Does each item present a clearly formulated task?
4. Is the item stated in simple, clear language?
5. Is the item free from extraneous clues?
6. Is the difficulty of the item appropriate for the students to be tested?

7. Is each test item independent and are the items, as a group, free from overlapping?
8. Do the items to be included in the test provide adequate coverage of the table of specifications?

Arranging Items

1. The items should be arranged so that all items of the same type are grouped together.
2. The items should be arranged in order of increasing difficulty.
3. For some purposes, it may be desirable to group together items which measure the same learning outcomes or the same subject matter content.

Ounce of Prevention Principle

One hour of colleague review of test is better than five hours of student complaints.

Colleagues can (1) look for congruence of test/items and course objectives, (2) look for ambiguity in phrasing and (3) review scoring key for accuracy and emphasis.

References

Basic Books

These paperbacks are good starting points for a first encounter with objectively scored tests.

Green, J. A.; Teacher-made Tests, New York: Harper & Row, 1968.

Gronlund, N. E.; Constructing Achievement Tests, Englewood Cliffs: Prentice-Hall, 1968.

(This book deals particularly well with different levels of learning (according to Bloom's taxonomy), using many examples.)

Wood, D. A.; Test Construction: Development and Interpretation of Achievement Tests, Merrill, 1961 (out of print).

(The only shortcoming of this book is its relative lack of explicit attention to the testing of different levels of learning. Otherwise it is excellent).

Standard References

Choices between these books are almost entirely a matter of preference for style, or availability. They are all good.

Adams, G. C.; Measurement and Evaluation in Education, Psychology, and Guidance, New York: Holt, Rinehart, & Winston, 1964.

(Chapters 10 and 11. Chapter 11 includes large numbers of items testing different levels of knowledge in a variety of subjects.)

Ahmann, J. S. and Glock, M. D.; Measuring and Evaluating Educational Achievement, Boston: Allyn and Bacon, 1971.

(Chapters 3 and 4, 4 dealing with high level learning. Chapter 11 discusses marks and grading. Quite up-to-date and extensive reference lists are included.)

Chase, C. I. and Ludlow, H. G. (eds); Readings in Educational and Psychological Measurement, Boston: Houghton Mifflin, 1966.

(Units 5 and 7. The latter includes a rare discussion of how students react in examinations and how this can be taken into account in test construction.)

Gronlund, N. E. ; Measurement and Evaluation in Teaching, London: Collier-MacMillan, 1971.

(Chapters 6 to 9. A main feature is the insistence on the relations between teaching, learning, and evaluation.)

Milton, Ohmer and John W. Edgerly, The Testing and Grading of Students, Change Magazine: New Rochelle,New York, 1976.

Nunnally, J. C.; Educational Measurement and Evaluation, New York: McGraw-Hill, 1964.

(Parts of Chapter 5 (p. 103 on), chapters 6 and 7)

Payne, D. A.; The Specification and Measurement of Learning Outcomes, Waltham: Blaisdell, 1968.

(Chapters 3 and 4. Chapter 3 of this paperback has an extensive discussion and chart (pp. 38-40) on matching the type of test to the learning situation. Chapter 10 discusses the assigning of marks and the philosophy of marking.)

Remmers, H. H., Gage, N. L. and Rummel, J. F.; A Practical Introduction to Measurement and Evaluation, 2nd ed. New York: Harper & Row, 1965.

(Chapter 8. Chapter 7 includes an interesting section on the participation of students in their own evlauation, including a college-level illustration (pp. 200-205.))

Thorndike, R. D. (ed); Educational Measurement, 2nd ed. Washington: American Council on Education, 1971.

(Chapters 2 to 4. Chapter 9 discusses the assessment of performance and products.)

EXERCISE VI

Testing and Grading

Prepare an evaluation of students' performance for the unit you have been working on.

Decide which objectives to test, how to test them, how to prepare students for your evaluation, and how to score and grade performance.

Actually prepare evaluation assignments, test questions, instructions to students, scoring procedures, and grading scheme.

TEAC4

(IMPLEMENTING INSTRUCTIONAL PLANS)

SUMMARY OF

PRINCIPLES OF LEARNING AND MOTIVATION

The following principles are basic to effective teaching.

1. MEANINGFULNESS

The subject matter must be meaningful for the student. For subject matter to be meaningful, the student should be able to relate to it personally. Consequently, the teacher should relate material to: (a) the students' past or present experiences; (b) the students' interests and values; (c) the students' future activities or aspirations; (d) material to be covered later in the course.

2. PREREQUISITES

The level of the students' previous knowledge is one of the most important factors determining learning success or failure. Therefore, the teacher should: (a) analyze each learning task to determine prerequisite concepts, principles, and skills; (b) test student knowledge of prerequisites (do not assume knowledge). Testing may be accomplished by informal questioning in which the answer to the question demonstrates knowledge.

3. MODELING

A student is more likely to learn if he is presented with a model of the behavior to be learned. This is especially true of complex behavior like problem solving. When presenting the model, the teacher should: (a) present the strategy or plan of attack beforehand; (b) point out and label all steps; (c) explain why all decisions were made and point out consequences.

4. ACTIVE APPROPRIATE PRACTICE

No learning occurs without practice. However, the practice must be relevant to what is to be learned. Therefore, the teacher should require students to state strategies for solving problems, answer questions about the application of principles or theorems, give examples. It is often better to space practice over a period of time.

5. FADE PROMPTS GRADUALLY

Complex learning often requires starting with hints (prompts). As learning progresses, the teacher should withdraw prompts gradually.

6. NOVELTY STIMULATES ATTENTION

Teachers should: (a) plan several ways of presenting the same material; (b) use several different procedures during a lesson. For example, modulating tone of voice, using several different examples, lecture followed by discussion, followed by question and answer.

7. OPEN COMMUNICATION

Learning is facilitated if the class is structured and instructor's messages are open to students' inspection. Therefore, the teacher should: (a) tell the students the objectives in each instructional unit; (b) tell students the reasons for all his actions; (c) permit students to ask questions.

8. PLEASANT CONDITIONS AND CONSEQUENCES

Learning is facilitated if instructional conditions are made pleasant, or at least not aversive. Therefore, the teacher should (a) avoid unpleasant physical conditions; (b) set challenging tasks; (c) give students feedback (to questions, answers, tests, homework) as soon as possible; (d) reward (by recognition) students' efforts; (e) avoid ridiculing or degrading them in any way.

9. ESSENTIAL CONTENT FIRST

Learning is accomplished with greater speed if only necessary ideas are presented. Course requirements and objectives should be analyzed to discover the essentials that a student must learn to meet the highest possible course standards. Present those ideas first and follow up with content which is "nice to know."

10. APPROPRIATE PRESENTATION

Learning is facilitated if the medium and strategy for presentation are appropriate for a) the unit objective (cognitive, affective, psycho-motor), b) the structure of the content (concept, principles, etc.) and c) the phase of learning (motivation, information, practice, memory, transfer).

Adapted from Davis, R. H., Alexander, L. T., and Yelon, S. L. Learning System Design. New York: McGraw-Hill Book Company, 1974.

A PARADIGM ON ASSUMPTIONS ABOUT TRUTH

ASSUMPTION ABOUT TRUTH I have: I possess:	INTERPERSONAL CONTEXT CREATED FOR THE LEARNER	QUALITIES AND FEELINGS CONFIRMED IN THE LEARNER	YEARNINGS AND HOPES GENERATED IN THE LEARNER	FOCUS OF DISCIPLINE AND EFFORT IN THE LEARNER	WHAT IS LEARNED as ways of being in the world
The Truth (assumes an end point)	conformity repressiveness coercion	limits weakness failure inadequacy hypocricy	to belong to be included	rote learning memorization performance quantity or accumulation	to be obedient to be dutiful to be good
my truth (you have your truth and I have my truth)	competition doubts ambivalence	egocentricity aggressiveness hostility possessiveness impatience	to have power to control	knowing better facts having more interesting information having more "special" experiences	to be certain to be the best to be strong to be tough
my sense of truth* (each person has his/her sense of truth) (assumes growth and expansion)	sharing searching groping trust in the process of emergence of meaning	trust in one's capacity to make sense curiosity empathy discovery excitement personal integrity legitimacy of thoughts and feelings	to grow to learn to change	listening understanding self and others generativity and clarification integration	to trust one self and others to be open to be tentative to accept ambivalence to choose and to act on or in spite of inadequate data

* I first came across this perspective in D. H. Lawrence's poem, "The Deepest Sensuality": "The profoundest of all sensualities / is the sense of truth / and the next deepest sensual experience / is the sense of justice." (D. H. Lawrence, Selected Poems, New York: Viking Press, Compass Books Edition, p. 116.)

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Axelrod, Joseph. The University Teacher as Artist: Toward an Aesthetics of Teaching with Emphasis on the Humanities. Jossey-Bass: Washington, 1973.

Eble, Kenneth E. Professors as Teachers. Jossey-Bass: Washington, 1972.

Dunkin, M. and B. J. Biddle. The Study of Teaching. Holt, Rinehart, and Winston: New York, 1974.

Mann, Richard D. et. al. The College Classroom: Conflict, Change, and Learning. Wiley: New York, 1970.

EVALUATION AND REVISION

EVALUATION AND REVISION

I. REVISION INVOLVES EVALUATION AND INDICATES MODIFICATION OF LESSONS, UNITS, AND COURSES. EVALUATION AND REVISION CAN FOCUS ON COURSE DESIGN, MATERIALS, OR TEACHING SKILLS.

II. INTRODUCTION - PRINCIPLES OF EVALUATION/REVISION

A. TEACHING AS EXPERIMENTATION

B. PROGRESSIVE IMPROVEMENT OF INSTRUCTION - AFTER DESIGNING (OR REDESIGNING) AND TEACHING THE COURSE, DETERMINE THE EXTENT TO WHICH OBJECTIVES WERE ACHIEVED AND WHAT UNFORESEEN PROBLEMS DEVELOPED. THEN REDESIGN THE COURSE TO ELIMINATE THE DISCREPANCIES.

C. IMPROVEMENT BY SUCCESSIVE APPROXIMATIONS

D. CONTINUOUS REVISION - CHECK OFTEN AND AT EACH STAGE OF COURSE DESIGN AND IMPLEMENTATION.

D. INTERACTIVE NATURE OF REVISION - NO COURSE COMPONENT OR PROCEDURE CAN BE MODIFIED WITHOUT HAVING AN EFFECT ON OTHER COMPONENTS OR PROCEDURES.

III. EVALUATION/REVISION PROCEDURES

A. EVALUATION/REVISION MODEL
(SEE NEXT TWO PAGES - "EVALUATION MODEL" AND "EVALUATION EXAMPLE")

EVALUATION/REVISION MODEL

TYPES OF INFORMATION	INSTRUCTIONAL PLANS	OBSERVATIONS
ENTRY CONDITIONS		
INSTRUCTIONAL STRATEGY		
OUTCOMES		

B. Questions/Sources of Data for Revision

Types of Questions Center Around:

Course Objectives:	are they adequate? do they meet the needs of the students? do they meet the needs of the curriculum?
Student Performance:	are you satisfied with it?
Materials and Methods:	is information presented so students enjoyed it and wanted to learn? are the tests fair?
Examinations:	are they reliable and valid? do you have a representative sample of students?

Sources of Information

Students: Critical Incident Approach

1-Identify the single incident which was most effective for you.
Identify the single incident that was least effective. Briefly describe each. Look for patterns.

2-Student Group Discussion at the end of the course. Ask them:
What worked?
What didn't work?

3-Behavior of students in class

4-Conferences

5-Student Liason Committee

6-Lecture Notes

Peers:

1-Review your materials

2-Review exams for content validity

3-Review objectives for validity

4-Classroom Visitation

Self-evaluation: 1-Critical Incident Technique

2-Self-Analysis "continuum"

3-Audio and video tapes

Student performance data: 1-Tests given in course

Question/Source Matrix: Who Can Judge What Best?

	Students	Peers	Self	Tests
Objectives	Clarity	Validity	Clarity Validity	See Student Perf. Data
Student Performance	Evidence They Accom-plished the objec-tives.	If course is a pre-requisite how will they do next year		See Student Performance Data
Materials	Clarity	Readings Content Outline		See Student Performance Data
Examination	Fair Fairly Graded	Content Validity		See Student Performance Data

IV. Barriers to Revision/Ways of Overcoming Barriers

A. Barriers

1. Attitudes
2. Effort
3. Cost/Effectiveness
4. Constraints
5. Fear of Failure/Unfavorable Reaction
6. Others

B. Ways of Overcoming Barriers to Revision

1. Understand Reasons for New Procedures--Know Your Goals, So That Success Can Be Identified
2. Revise in Easy Manageable Increments (Principle of Successive Approximations)
3. Revise As You Go Along (Principle of Continuous Revisions)
4. Try Out New Procedures in Secure and Cooperative Situations (e.g. Make first attempt in best class)
6. Gain Peer Group Support

THE EVALUATION OF UNIVERSITY TEACHING:

TEN FACULTY-INITIATED METHODS FOR GETTING FEEDBACK FOR IMPROVING INSTRUCTION*

Historically there have been three primary purposes for evaluating teaching at the university level. Each of these purposes has corresponded to the information and decision-making needs of a different segment of the academic world. Students have desired such evaluations to assist them in making choices among courses and instructors. Faculty review committees and university administrators have increasingly required documentation of teaching effectiveness in making promotion and tenure decisions. Individual faculty members have long used various kinds of strategies for getting "feedback" on their own effectiveness in order to make changes in their own courses and methods of instruction.

While there are a number of different procedures for evaluating teaching, the one most frequently employed in universities is the student end-of-course questionnaire. While the end-of-course questionnaire is undoubtedly a useful device for gathering information which is relevant to all three evaluation purposes, it is probably not the most useful procedure when the primary purpose of evaluation is to provide individual faculty members with the kinds of feedback which can assist them in making improvements in their own courses or methods of instruction. There are at least two reasons for thinking that it may not be. First, the information comes back to instructors at a time when it is already too late to make any changes which might benefit the students who have evaluated them. Second, the information is usually of too general a nature to give instructors specific cues as to what they might do to improve a given course.

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*Robert C. Wilson and Lynn Wood, Teaching Innovation and Evaluation Services, University of California at Berkeley, January 1974.

For these reasons the TIES staff began to search for alternatives to end-of-course questionnaires. Our search focussed on methods which a faculty member or teaching assistant could initiate for getting feedback for improving his or her own course and methods of instruction. The examples range from simple kinds of activities which can be put into immediate effect to more elaborate ones which require planning, technical assistance, or financial support. The ultimate worth of any such self-initiated method of evaluation is, or course, its usefulness to the individual instructor.

It is suggested, therefore, that if you judge any of the alternatives to be meritorious on its face, you try it out experimentally and evaluate its usefulness to you as a teacher. The TIES staff would be glad to assist you in designing and carrying out such experiments or by providing additional information, literature, or examples of such evaluation procedures. Indeed, whether or not assistance is desired, we would be greatly interested in learning of any experimentation you do with these or similar methods, so that our knowledge of their usefulness can be increased.

Student Liaison Committee: Establish a Liaison Committee of 3-5 students to meet with you once a week to discuss how the course is proceeding (its high points and its low points, student difficulties or dissatisfactions, etc.). In a very large class the students should probably be selected on a "district" basis within the seating arrangement of the room so that all students have relatively easy access to one or more members of the committee. Rotate membership on the committee from a list of volunteers if that seems desirable, but be sure other students know who the liaison students are at any given time.

Student Lecture Notes: The difference between what a teacher says and what each student hears is often not apparent to either faculty or students. Ask all or a sample of students to lend you their notes at the end of a lecture session so that you can compare them with your own outline or with an audiotape of the lecture. If desirable, the anonymity of students' notes may be preserved by using code identification. This exercise can be particularly useful if students have rated you low on organization and clarity of presentation in previous classes and you wish to understand the problem more concretely and try to do something about it.

Audiotapes and Interaction Analysis: Tape-record a discussion session or seminar. Then using portions of an interaction analysis schedule (several are available) listen to the tape several times, each time analyzing a single aspect or variable of effective small class discussions (e.g., "wait-time," or the amount of time you allow for students to answer a question before you answer it yourself, the questioning strategies you employ, or the relative percentages of class time devoted to teacher-talk versus student-talk). If student participation is an important objective of the class, you might wish to have the entire group analyze the tape in terms of small group discussion principles.

Videotaping: Have one or more of your classes videotaped. Often it is more instructive to have the camera concentrate on the students rather than on yourself. Then look at the tape - as many times as you wish - each time analyzing something different about your teaching, e.g., your skills as a discussion leader, the attentiveness of your students, the organization and

clarity of your lectures, the kinds of questions you ask students, and the way you respond to their answers. As in the case of audio-taping, it may be helpful to use portions of an interaction analysis schedule to guide your observations. If it seems desirable, show the tape to a colleague, to someone skilled in interaction analysis, or to someone versed in a variety of effective teaching strategies and whose comments or suggestions might be helpful to you. You may wish to repeat this exercise periodically to see to what extent you have succeeded in those aspects of your teaching which you have singled out for improvement.

Colleague Visitation: Invite a teaching colleague to visit one of your classes, to observe the instructional process, and to make suggestions. This procedure is probably most useful when you have had some discussion beforehand about what you are trying to accomplish in the class or the particular technique you are trying to perfect so that your colleague can focus his or her observations. This will make the task easier for your colleague and his observations more useful to you.

Telephone Answering Service: Install a 24-hour telephone tape answering service for student use in submitting questions or relating difficulties that they are having in a course. By listening to the taped calls each morning, you and/or your T.A.s can make plans to respond to students' questions or problems at the next class meeting. This method has the advantages of immediate, anonymous feedback from those students who are experiencing difficulty or dissatisfaction at the time they are experiencing it (e.g., 3:00 a.m. while working a problem set). It is probably most

appropriate (and economically feasible) in very large courses where sheer numbers make personal communication between student and teacher difficult and/or courses where students are given frequent assignments.

Focussed Questionnaires: Distribute a brief evaluation form to a small random sample of students in a large class. This "questionnaire" can be as simple as a blank 3" x 5" card on which students are asked to comment on what happened in class that day or a half-page mimeographed sheet asking about several specific features of the course to date (e.g., experimental aspects, traditionally difficult assignments, aspects of your teaching performance which you feel may need changing, etc.). This method has the advantage of providing immediate feedback while there is still time to take some action on the basis of it. It also reduces the number of questionnaire responses (through sampling) which must be read and analyzed. Repeat the process with the same or a different "questionnaire" whenever you feel the need for feedback or information on some specific topic.

Early Student Ratings and Self-Ratings: Design and administer a rating form to students early in the quarter, asking for their opinions about specific aspects of your course and your teaching style. Fill out the same form yourself and compare your self-ratings with the students' ratings. If there are large discrepancies on certain items, consider various courses of action (e.g., changing some parts of the course or some aspects of your teaching style; discussing discrepancies with the class to clarify misunderstandings). Administer the forms again at the end of the course to see whether the ratings have changed in response to your efforts. While this method is probably

most useful when you use a tailor-made form, you may wish to first try out the method using an established questionnaire which seems to have appropriate items.

Student Characteristics and Course Objectives: Design a questionnaire which will elicit information about student characteristics which you suspect influence the instructional process (e.g., their learning styles, prior experiences, preferences for teaching styles, objectives for taking the course, etc.), and administer it at the beginning of the quarter. This initial questionnaire will give you information about your students which can aid you in maximizing their learning (e.g., by creating various instructional options) and in educating them to your own objectives for the course as well. At the end of the quarter a similar questionnaire may be used which asks how well both student objectives and your objectives have been met by the course. In very large courses, sampling procedures may be used to limit the volume of data.

Course Impact: At the beginning of the course administer questionnaires or tests to elicit information on student knowledge, understanding, abilities, or appreciation of the subject matter of the course. Repeat a similar questionnaire or test at the end of the course so as to measure student change in any or all of these areas. Standardized tests may be useful in some subjects, but for the most part the tests and questionnaires will have to be tailored to the course. Pre-and-post measures of learning might be based on two versions of the final exam or by submitting blind samples of student work from the beginning and the end of the course to a panel of

competent judges (teaching colleagues or advanced graduate students). Questions may also be included which ask the students themselves to assess how much impact various aspects of the course have had on them.

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The preceding list of ten methods for getting feedback for the improvement of instruction is meant only to be suggestive. Each of the methods could no doubt be modified in a number of ways to make it more useful in any given teaching situation. Continued experimentation and research by college and university teachers will add to and improve upon such a listing. Our reason for briefly presenting some of them here is to summarize in one place a wider range of evaluation methods than is usually considered by faculty.

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EXERCISE VIII

Design a plan for evaluating and revising your course. Use the model of evaluation/revision presented in this section. You will need to decide what aspects of the course to look at, which information sources to tap, and at what times in the course to collect certain data.